

# VAA-Weekly-Progress

04/01-04/08

# Context

- Last week, we labeled all antelope biological definitions
- Continued some experimentation with species-similarity, which was bottlenecked with deadcat gpu issue (which has since been resolved)
- Reviewed poster outline

# Goals

- Label the rest of the visible and biological keypoints - Everyone
- Visible keypoint dataset training and testing - Medha
- Ap10k training and Visible fine tuning and testing (are we training on all of AP10k or just antelopes (and if so, would these need to be excluded from the fine-tuning image set)
- Biological keypoint dataset training and testing - Claire
- Ap10k training and Biological fine tuning and testing (are we training on all of AP10k or just antelopes (and if so, would these need to be excluded from the fine-tuning image set)
- Ap10k (just antelopes) training and testing -Zian
- Train & Test AP-10K based on top 10 of random list and our top 10 - Parth
- Create a finalized poster draft: Everyone

# Visible experimental setup

- Created a script to first preprocess the midpoints (ex: hip\_top and hip\_bottom\_right to make right\_hip), then average all keypoints across labelers
- Train, validation, and test sets are created with an 70:15:15 split and the same exact images are used for train/val/test for the AP10k comparison
- Both AP10k set and Visible set have the same images, so the only variable in this comparison is the annotations themselves (+ some variability during the training process)

# Visual Representation of both labeling schemes (Visual)



Visible



AP10k

# Visible vs AP10k Comparison

We also ran a Visible (fixed), for which we went back over the annotations and fixed them to better fit the Visible definition (mostly fixing the neck point and the hip points, mainly hip top, and occasionally fixing a wrongly labeled point)

Metric	Visible	Visible (fixed)	AP10k
coco/AP	0.725	0.712	0.692
coco/AP .5	1.000	0.938	0.935
coco/AP .75	0.842	0.842	0.782
coco/AP (M)	-1.000	-1.000	-1.000
coco/AP (L)	0.725	0.712	0.692

# Biological Experiment Set-Up and Obstacles

- Similar set-up as the visual experiment:
  - Created script to preprocess data by averaging all keypoints across labelers
  - Train, validation, and test sets are created with an 70:15:15 split and the same exact images are used for train/val/test for the AP10k comparison
  - Both AP10k set and biological set have the same images, so the only variable in this comparison is the annotations themselves (+ some variability during the training process)
- Initial error of invalid number of keypoints
  - AP10k and visual annotation have 17 keypoints while biological annotation has 21
  - Solution: Created a custom dataset that had 21 keypoints  
(`mmpose/mmpose/datasets/datasets/animal/bio_dataset.py`)

# Visual Representation of both labeling schemes (biological)



AP10k



Biological



# Biological vs AP10k Comparison

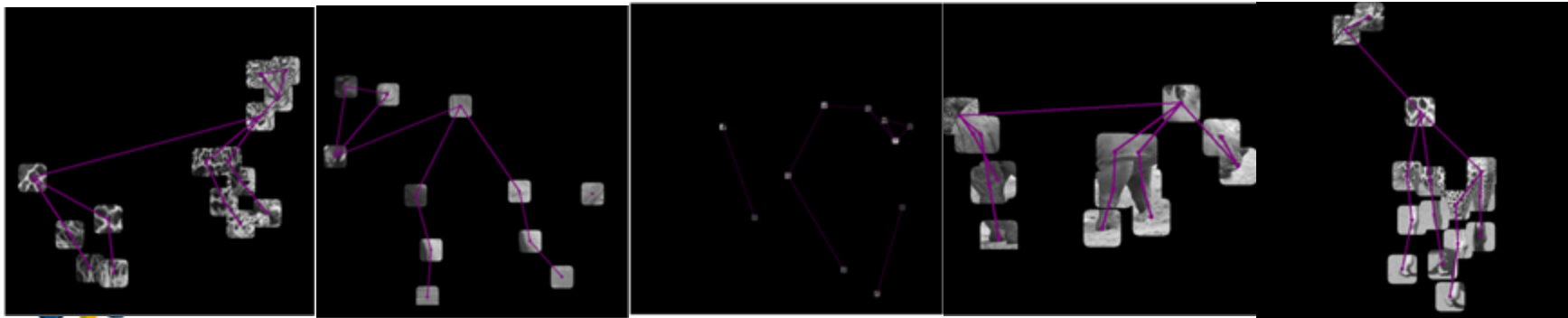
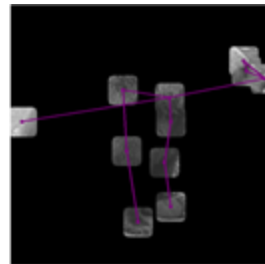
The biological annotations performed significantly worse than the matching AP10k set.

Metric	Biological	AP10k
coco/AP	0.209	0.782
coco/AP .5	0.499	0.941
coco/AP .75	0.123	0.829
coco/AP (M)	-1.000	-1.000
coco/AP (L)	0.209	0.782

# Fusing Patches and Keypoint Overlay for DINO+SD

**Hypothesis:** They both provide valuable information about the keypoints and so possibly giving DINO+SD both the overall and fine grain details of the key points will maximize the effectiveness of DINO+SD.

**Input Images to DINO+SD:**



# DINO Top 10 Species Similarity Lists

Human Choice = ["deer", "moose", "zebra", "horse", "giraffe", "argali sheep", "sheep", "cow", "bison", "buffalo"]  
SD+DINO COS = ["deer", "giraffe", "cheetah", "moose", "argali sheep", "fox", "buffalo", "zebra", "rabbit", "leopard"]  
SD+DINO KNN = ["deer", "giraffe", "moose", "bison", "rabbit", "cheetah", "argali sheep", "sheep", "zebra", "leopard"]  
SD+DINO KP Overlay COS = ["deer", "giraffe", "fox", "sheep", "cheetah", "cow", "wolf", "rabbit", "dog", "bobcat"]  
SD+DINO KP Overlay KNN = ["deer", "giraffe", "rabbit", "cheetah", "fox", "rhino", "wolf", "sheep", "moose", "zebra"]  
SD+DINO KP Patch COS = ["deer", "giraffe", "zebra", "bison", "argali sheep", "buffalo", "sheep", "cheetah", "cow", "fox"]  
SD+DINO KP Patch KNN = ["deer", "giraffe", "bison", "rabbit", "fox", "argali sheep", "buffalo", "cheetah", "moose", "cow"]  
SD+DINO KP Fused COS = ["deer", "giraffe", "sheep", "bison", "fox", "buffalo", "zebra", "cow", "wolf", "hippo"]  
SD+DINO KP Fused KNN = ["deer", "rabbit", "giraffe", "bison", "fox", "polar bear", "lion", "leopard", "rhino", "weasel"]

## Notes:

- Giraffe in all
- Horse only human choice
- KP Overlay favors wolf
- Rabbit & Fox in almost all SD+DINO lists(Why do small animals keep being favored? -> Maybe being enlarged too much)
- Fused lists are much different than the rest(polar bear, lion, rhino, hippo, weasel)

# AP Comparison of RTMPose Trained on Data From:

	Full AP-10k redistributed	Top 10 Dino+SD Full AP-10k Cosine Similarity	Top 10 Dino+SD Full AP- 10k KNN	Top 10 KP Overlay Dino+SD Cosine Similarity	Top 10 KP Overlay Dino+SD KNN	Top 10 KP Patches Dino+SD Cosine Similarity	Top 10 KP Patches Dino+SD KNN	Top 10 Fused KP Patches & Overlay Dino+SD Cosine Similarity	Top 10 Fused KP Patches & Overlay Dino+SD KNN	Top 10 From Humans	10 Random Species
coco/ AP:	0.818	0.791	0.785	0.759	0.787	0.792	0.800	0.780	0.751	0.821	0.749
coco/ AP .5:	0.969	0.967	0.967	0.967	0.968	0.968	0.979	0.959	0.949	0.969	0.949
coco/ AP .75	0.884	0.857	0.862	0.822	0.884	0.874	0.872	0.836	0.830	0.885	0.821
coco/ AP (M):	0.799	0.680	0.753	0.659	0.755	0.759	0.734	0.755	0.701	0.756	0.749
coco/ AP (L):	0.817	0.793	0.784	0.760	0.786	0.791	0.801	0.779	0.753	0.821	0.748

# AR Comparison of RTMPose Trained on Data From:

	Full AP-10k redistributed	Top 10 Dino+SD Full AP-10k Cosine Similarity	Top 10 Dino+SD Full AP- 10k KNN	Top 10 KP Overlay Dino+SD Cosine Similarity	Top 10 KP Overlay Dino+SD KNN	Top 10 KP Patches Dino+SD Cosine Similarity	Top 10 KP Patches Dino+SD KNN	Top 10 Fused KP Patches & Overlay Dino+SD Cosine Similarity	Top 10 Fused KP Patches & Overlay Dino+SD KNN	Top 10 From Humans	10 Random Species
coco/ AP:	0.834	0.812	0.809	0.782	0.808	0.815	0.822	0.800	0.774	0.838	0.771
coco/ AP .5:	0.975	0.971	0.971	0.971	0.971	0.975	0.985	0.966	0.956	0.975	0.956
coco/ AP .75	0.892	0.873	0.873	0.838	0.892	0.882	0.887	0.848	0.848	0.897	0.833
coco/ AP (M):	0.817	0.717	0.783	0.683	0.783	0.783	0.750	0.767	0.733	0.783	0.783
coco/ AP (L):	0.834	0.815	0.810	0.785	0.809	0.816	0.824	0.801	0.775	0.839	0.771

# Poster

- Still a work in progress, but updated version in box

# Personal Progress

# Medha

- Continued work on poster overview, visible portion, and next steps
- Created script to convert label-studio annotations into coco-format with midpoint procession and labeler consolidation
- Ran training and testing for visible images and ap10k matching set



# Parth

- Labeled 40 images with biological keypoints
- Ran 2 individual model runs for 2 more top 10 lists
- Worked on the poster

# Claire

- Modified Medha's script to convert the Label Studio annotations to COCO formatting for biological keypoints
- Trained and tested the biological keypoints and matching ap10k set